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DEPARTMENT OF THE INTERIOR

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K. M. Waage 1955 Notebook #4 doc. 467
 Inyan Kara study #2

	Locality W-12	
	(Notes on Robinson-Theobald I.K. section (# I.K. 2) —	1.
7427	Route 116 reconnaissance S. of Sundance —	4.
	Brief of Robinson-Mepel Cabin Creek section —	6.
	W-13. Cabin Cr. section re-examination —	7.
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	<u>4636</u> VP only	

Look at Arch Creek - porcellanite?
Calc. Mervish.



Possible criteria for M-FL contact.

1. Base cglte ss
2. Highest calc. beds
3. Lowest dk gray or carb clstn beds
 - a. color
 - b. degree
4. Color, zebra, in clstns.
5. Key beds such as conc. zones, porcellanites.

Locality W-12

W-12 (Lower section of Robinson and
Theobald)

Part A. In section below hill of mss.
section and that to the SE
(where was little old brick blob
Fall River on S side)

Wash

5.0 claystone, red, plastic

0-1± conglomerate or coarse to
cyltic ss., loc. calc.

0.6 white, hard platy sandstone
weathered in white chips &
flakes. May be porcellanitic
not calc. Has some chert
granules.

5.3 claystone, red, soft, hard, green
and yellow mottling at top

10.3 claystone as below but chert
light ^{greenish} gray ~~stone~~, some
red mottling at base, yellow
in upper part

11.3 Sandstone, med-coarse gr. fizzes
white to yellowish, on
weathered slopes locally becomes
argillaceous in upper part

9.8 Claystone, sandy calc. argill.
Sandstone, partially washed
covered. Upper 2' is
sandy hard clstn, var.
red + green, with coarse to
fine grains qtz & chrt. upper
0.6 white weath.; below
some yellow, red + conch.
streak on gray white
columns. The 0.6 white
zone is fine gr. lam. ss
loc. with some of var.
clstn in lenses in it.

2.0 - ? Shale dk gray to black
with silt laminas
Top of local outcrop.

Locality W-12

Part B

Shale dk gray black
Fall River - Lakota contact

- 2.6 Sandy unvegetated clst, grading
to ss below. Worth white sand pink
coarse sst gray to red
27.5 Sandstone fine gr to coarse
color variable white, chest
+ qtzl eq^l in base 4'
locally

Below this is claystone, dk gray red.
Some of the upper 10' is but
above in 2' but 2.5', then
to purple with green mottling
below to about 10' above next
sandstone. This is gray with
some greenish zones.

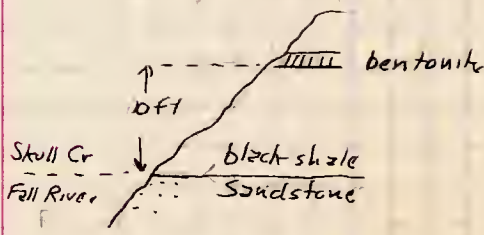
From base of Rat's lower ss
is 1215 feet claystone, upper
7 is greenish gray then
about 10 red, then gray with
band black about 0.6 above
ss. Then ss, hard loc, ± 2.0 but
laterally l.s. out. Has 1' of
Venus thin 64 dk gray to black
claystone, qtzl to ss. Then
Then comes 9'

limb and interval consists
alternately fine ls. + grayish
gray to gray claystone

Dinosaur bones are due N.
of barn, 30° NE bridge +
55' E fence

Route 116 Reconnaissance. - S + E from Crook -
Weston Co. line. Fall River exposed
in road cuts and stream bluffs
could possibly piece complete
section here though the bottom
contact would have to be dug out

Contact with Skull Creek in
first road bank W of the last (but
bridge over Illinois Cr. the
bank, the gravel shows black shale



and a thin
contact with
at loc. 1
bentonite,
10' from
base.

The lower part of the Skull Creek



fossil loc.
—

is fairly well exposed. At south
of highest knobs with gent. in
creek gulleys is floor of siliceous
fine ss, gray, with Lingule.
No vert fos. seen at this loc.
The Lingule ss is exposed in the
last road cut* to the west,
North side, where c. 10' consists
of irreg. interbedded ss & sh.
& loc. siltstone, over 5' thick.
*(Second bench cut N side rd
W of Mason Creek.)

Locality W-12

Robinson - Mapai - Cabina Cr. Section.

Base up.~

- 10+ Redwater
- 4 sandstone
- 8 claystone (obs)
- 2 limestone
- 18 claystone
- 5 sandstone, calc.
- 56 claystone, sandy zones
- 1 limestone
- 34 claystone, some limestone
- 4 conglomerate
- 105 claystone, 29-34 above base, cgl.
and above this 7' is another thin one
- 18 obscured
- 35 massive calc. ss.
- 10 sandy shale
- 4 shale
- 5 sandstone
- 7 sandy sh
- 3 sandstone, limy
- 20 obs. 18 sandy sh + ss
- 5 sandstone
- 35 18 sandy sh + ss
- 10+ sandstone



W = 13

Cabin Creek section

Part A, Measuring down from massive bed which is locally 2nd ss. ledge up from the base of the Fall River

2.0+ Sandstone, massive, fine-gr, sandy micaceous. Single bed with columnar structure, weathers buff with some CB staining. Locally with narrow vertical burrows. Contact with bed below locally even cutting, irregular. Fossil ledge

3.6 Sandstone - fine gr silty and sandy silty; clayey, with horizontal gray, weathers light blue to purple. Some with clay like texture. Soft, cherty, some with some sandy siltstone interbedded ss. thin upper bed

1.2 Siltstone, silty, and with shal, with some thin beds of clayey gray, flake to silty clay, carb flecks, weathers rusty to yellow gray

0.5+ Silty, fine, laminated, ferruginous, commonly single to double bed



0.7 Shale, gray above below 14' and
below 15' is silty

3.5 Sandstone, fine-gr, loc. silty,
interbedded with silty clay
with yellowish stain, caps
ledgy, but upper part is
very weak

7.7 Sandstone, thin bedded, to tabular,
coarsening upward, silty, some
shaly ss layers, with
pebbles in upper 1/2 and
is locally shaly. Top 2' is
locally top ss. Lower 2' is
1.5. Lower 2' is
further & lower because of silty
in lower part + grading to bit
below. Silty, some shaly, loc. silty,
with some small pebbles
bedding planes common

1.9 tabular, silty, silty, some shaly, some
sandstone and black shale. Some
brown, irregular, wavy-bedded

1.9 Shale, hard, silty, gray, with
abundant plant frags. Fe stain loc. +
some Fe cones with clay centers



Fox River - Lake contact

4.3 Claystone, silty, minor clayey siltstone
top, light gray. Fe speck on face in
sun, weathers bright orange
yellow. massive, becoming
silty downward.

1.0 Claystone, silty, minor clayey siltstone,
some yellow stain.

1.7 Claystone, silty, minor clayey siltstone
with clayey siltstone, Fe speck
on face, weathers bright orange
yellow. massive, becoming
silty downward.

5.3 Siltstone, silty, minor clayey siltstone
with Fe speck on face, weathers
bright orange yellow. massive,
becoming silty downward.

2.0 Sandstone, silty, gray, fine,
fairly clean, weathers
tan to light brown.

2.0 Sandstone, silty, gray, fine,
fairly clean, weathers
tan to light brown. becoming
silty downward.



0
(Offset here to E on to ss. below)

Part B

3-5 Sandstone, variable in character but chert, fine-med gr, with local s. -gers chert & qtz in basal 5-10 ft. Massive to thinly bedded-crossbedded, weathers gray-white, yellow stain to millbr loc. of irony red stain. Some intercal. clay. loc. in x-bedded.
3.0 Coarsened log slump + wash, base of ss. where the fine interval.

10.5 Bedded claystone, dark gray, weathers claystone, dark gray, at least in upper part. Some s. -gers and chert in part. Loc. of irony red stain.

4.3 Up to med. med. gray claystone, some s. -gers and chert. Loc. of irony red stain. qtz & chert bands in claystone. 3-4 ft. med. gray claystone.

1.0 Sandstone, clayey, coarse & conglomeratic, and sandy claystone, gray - weathers gray-white + yellow. Grains + gravel. chert & qtz + fragments (or interstr.) and fine sand in up. 1/3.



2.5 Claustone, gray to dark gray, very
scattered che granules. Becomes
sandy in lower part

12.0 Sandstone, med-coarse & calcareous
interstitial gray claystone, and
claustone sandy to coarse sandstone.
Chert & sand with zones
claystone. Contains abundant
pale purple. Chert is a few
gray with gray white.

2.0 Claustone, light gray, medium to
coarse grained, scattered grains of
pale purple of qtz & chert.
Sandy xls.

7.9 Claustone, medium to coarse grained,
gray & purple. Has scattered
chert & slightly med-coarse
grains of chert.

7.9 Sandstone, fine to med., inter-
calated with a bit scattered
coarse and quartz granules
Gray, intercalated with

4.0 Claustone, gray green, scattered
chert & qtz in upper
part, med-coarse



10.6 Clayey, cherty red + purple
red with to sl green
mottling. Upper 3' variable
red + green, below
red which has scattered
medium-sized sandstone
quartzites. Some dark
green + yellow mottling
in lower 2'

12.8 Clayey, red with minor green
mottling. Sandstone and
cherty. 1st bed of green 1.5 to 2.5
above base

15.6 Sandstone fine med, fine.
st. to clay. Sandstone sand-
green and claystone and
quartzites in upper 2' -
ss, with some fine to med
clay. The 10' sandstone is
gray, weathers with a
mottled green. Can see
quartzites and sandstone
pebbles of chert and
quartz. At base is a
quite bed of 3' which
drops locally as large
blocks.



6.7

Sandstone, as above, with some sandy claystone in upper 2 ft, fine to med. clay to silty clay. ss below with prominent more + coarse sand + qtz granules. Base of 0.4 to 0.8' locally indurated somewhat, is coarse qtzite ss, calcareous.

8.3

Sandstone, clayey (calc.), and calcareous claystone. Gray weather gray white. Section ch + qtz granules. Zone 1' from top and 1' from bottom is coarse sand qtzite is at base, weather brown + white, is calc. thin, (Sample 1)

19.9

Sandstone, as above, some partly indurated layers some with coarse med. silty clay. 2 or 3 coarse sandstone bands. Sandy to qtzite is coarse and several qtzite zones, including indurated base. 13



All calc stuff chert + qtz in
granule to sub-^{upper 1.5 is} pebble size
Basal cal thickness local
to 3.5, is brown weath.
+ locally has zinc ore
carbonize plant frags.

6.1 Claystone - clay + clay.
Sandsstone. Few sections
chert + slight qtz. All calc.
All calc. Gray to
clay gray in middle
part, lighter gray
lower part.

Point C. - Approx section taken
looking up from yellow-brown
sandstone to top of sandstone
7-12 ft. from top of gray shale
lower part. Section about 10
feet.

In the above section - approx 2' at top
of sandstone. Approx thickness is 4' but
this only top of it - or within it

24.5 Claystone. Varying color, clay.
abundant. Calc.

25.5 Sandstone. approx 1-2 ft.



15.0

845

B

64

1





W-14

Sturgis section

Part A
(Upper Relict)

23.0 Siltstone, massive cross-lam, to irreg thin-bedded + cross bedded, fine-med gr. Weathered brown. Carb frags.

4.0 Interbedded, siltstone, shale and sandstone. Upper 1.3 is white-weather sandy siltstone with local thin beds sandstone. Then 0.7 - 1.0± of gray shale with carb fragments. basal 2.0± is silty white to gray ss, cherty massive except at base where it becomes platy and grades into unit below.

3.0 Sandstone, thin bedded, fine gr, locally has 1.0 or more of at top, weathers gray to CR. Forms sandy clay lenses. Lower 1.0 has interbeds of gray silty sh + siltst. Carb frags

0.8 Siltstone gray, loc. shaly, soft



2.9

Siltstone, fine bedded, fairly
low water, gray to light siltstone
Locally some thin beds of fine
silty ss. intercalated. Dk gray
laminar and shaly near base
inter. weathers gray

1.5

Siltstone, brown, dk + light ss
above, plant fragments, loc
sandy; diff. from above
in being more massive
bedded. Plant pieces in lower part
(In not cut down this is fine ss ledge)

1.9

Siltstone, massive in lower
part, somewhat shaly in
upper. Dk gray to black
locally carbonaceous. locally

= 0.9 Silty gray siltst.
carb frags, crumbly

0.6 Hard dk gray-bk
siltstone, plant
+ frags

0.4 As above but crumbly
locally somewhat clay

Trail River - Lakota contact.

(Part B)

4.6

Siltstone, gray, ferruginous, with
Fe specs, weathers orange clay,
yellow, grading down
into silty claystone to



gray claystone. Crop western
yellow & white. Upper foot
of siltstone heavily stained
with Fe concentrated in
thin layers. Locally hard
siltstone. Lenses of sandstone
in this upper ft. Ave
massive vertical fract.

8.3

Claystone & siltstone. Gray
with brown & red, yellow
& brown. Has Fe spots. Loc.
silty gorges, and thin
siltstone ^{near by}. Some
assoc siltstone. Some
conc. Fe in blocks.

8.0+

covered interval to top
massive ss w of road

Part C

Top of loc. w of road between
exposures of contact above &
exposures of massive limestone
down hill.

6.0+ Interbedded w. gray
with red siltstone
and thin-gr. sandstone
in basal part so in
beds to top. Upper 2.5



chiefly platy thin ss and siltstone.

Rests on massive ss unit below and occupies lower 6' of 8' obscured interval base of Part B.

Part D.

Big tabular ss in E side roadcut.

c 62.0+

Ss - some massive clay containing brash 22-25 feet above base separates a lower coarse-grained local cyclic ss from upper medium-grained. About 0.2 of light gray claystone & brash, greenish calcareous clay. Upper part has a few thin silty silty partings & some massive bedding. Darker weather brown, some silty ss in upper part.

in 20

to clay.

B 2.9

Claystone, frequent, gray to light gray. Upper 0.6 to 1.0 is hard local gray silty and contains large logs. (Sample 1 = spec fossil wood) (Sample 2 = frag claystone)



Beneath logs claystone softer and not generally silty. Has local coaly partings.

- A 13.0-? Claystone, dark gray to black silty, with intervals of fine gr. l. or gr. Fc stained (O) ss up to 0.6 thick. Sandy intervals and lenses do not hold constant position in outcrop face. Lower limit of interval exposed also shows some intercalation of sandy, this is more a transitional thickness.

Slope down and slump

- Part E At outcrop down to base of 7'± of unit above shows local gray to black silty clay and det. sand. Thickness of interval A of part D estimated at 27.0± on basis of comparison with zone from to part E. The outcrop is 5'± thick.

Base of Unit A, Part D. measuring down

22.7 Sandstone, med. gr. silty, with intercal. of gray clay



up to 0.6, chiefly in lower half.
Some times clayey ss, which
weathers light gray, yellow cast,
some to yellow & even to tan.



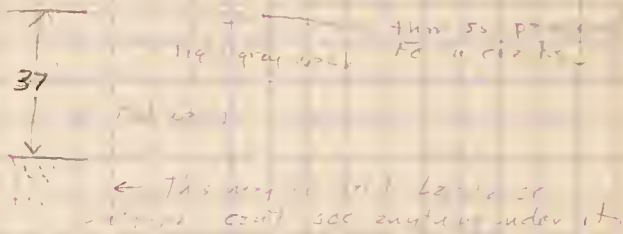
5.0 ± Variable zone between ss unit & dyke. Thin. Contains a congl. zone, made up of coarse cgl sandstone, cgl + qtz pellets, Med gr ss lenses, cgl clayston with ss pellets & cgl. zone throughout many rounded pebbles & cobbles of cgl + sandy cgl. Locally, lower ^{base} of unit shows cuts of oil. Best exposed at end cut where it is hard to find. Sndy clay cgl in soft ss matrix with harder lenses of cgl + qtz pebbles. Cgl + ss. Locally some better cgl but most is in fragments.

Polished pebbles found in place scattered sporadically through this zone.

11.0 ± Sandstone, med coarse, cgl at top with some pebbles. cgl + qtz. Med cgl. zone. Fragments of ss. Grains + grains in sandstone. Warty butt to butt. Best of cut.

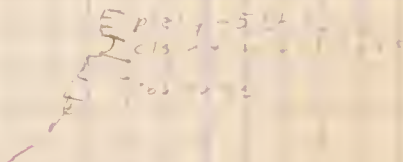


Just to NE of cut Pt. A. Soil
with low lignite ss at base.
From top the ss has a ripple.



Above, α and β are reduced basis
2nd unknown interval to β
of base prof. α .

No. 10 Dated & Just - in relation to as
outgoing, I prob. is - pzi
though no more can + some
else - ...



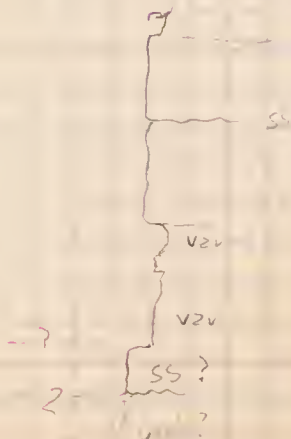
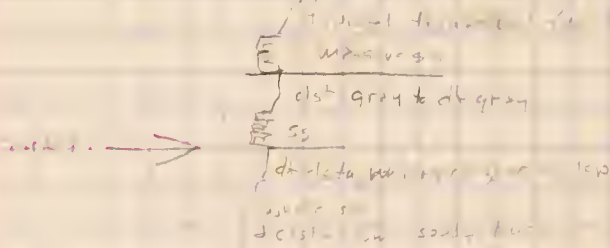
Fern. plz. so heavily up, it is 7
feet to pass. The water is
capped & point at mon. ment. to
beads, p. r. above, 1. 6. 1. 1. 1. 1. 1. 1.
or more. The water is 1. 1. 1. 1. 1. 1. 1. 1.
The group of clouds.



light gray sandstone, but upper
10' ± dk gray with red variegated
zone at top.

Sandstone capping this thickness
next. would 6-? massive, brown
weather. Above is more claystone
to F. Rive. contact, which is
exposed just S of dinosaur
statues.

Approx sec on Larkspur





W-16

Rapid City route 16 sec. 16

Starting in base of sec 5 of US 16
just sw Rapid.

9.-? Sandstone, massive, fine to
medium grained, tabular & low
weathered brown.

5.5 Partly obscured, upper 2-3 ft of
sandstone, gray, fine grained
sandy & lensed + thin bedded.
Some gyp in upper thinness, which
locally has weak yellow stain

4.2 Claystone, gray, silty to sandy

24.7 Claystone, gray silty, loc. sandy -
silty sand, var. red, brown
and yellow, upper 3.0 is
stained yellow & orange, is
lighter gray, weath. white
with yellow & orange stain.
Fe spots pepper entire.
variegated zone. d. zone
a number down to 2 ft.



1.3± Sandstone, massive, fine gr.
buff weath. loc. silty, carb
particles

1.3 Silty sand, gray, massive

11.4 Interbedded gray to black shale
and silty shale, and thin beds
of siltstone and fine grained ss.
top 3.0 chiefly black, blocky
shale becoming silty
in lower part, weathering

2.5 Siltstone, even bedded,
few ss layers, locally
sandy at top forms
ledge locally. weathering

5.9 Interbedded gray to
dk gray silty sand
clstn + thin beds
laminated fine gr ss
+ siltstone, some
Fg brown stains,
weathers gray brown

1.9 Siltstone, even, massive, gray
gray, carb flecks. Has some argill.
shaly siltst. carb traces in upper
part. Grades to units above +
below.



P 2.0 Sandstone, thin-bedded, gray, weathers buff to white, gray, forms platy ledge for masonry with beds evenly 18.5 where latter is massive. Weathers to

C 20.0+ Interbedded siltstone and fine grained sandstone, laminated, thin-bedded, weathers to brown. A variable unit which goes laterally both to shaly siltstone shaly with thin ss beds and to arenaceous ss, though latter mostly in upper 10' while lower part remains relatively soft & silty.

B 5.0 Siltstone, shaly, gray, some thin lenses sandstone & sandy siltstone ^{cherty} in base. Definite.

A 4.6 Sandstone in massive beds, laminated to x-bedded with some fine interbedded shaly gray siltstone. Laterally this cleaned sand unit lenses out into shaly siltstone (see part I) but to what appears to thicken to local beds more or less 15' or more



thick.

Part B

From top unit C Part A
measuring up the gully about
50' to N of part A.

D 5.3 Siltstone, shaly, micaceous
shale. Some thin beds fine gr
ss in basal 2 ft, and
upper 1.5.

C 7.3 Siltstone as below, with
three interbeds laminated
fine-gr. sandstone which
commonly Fe impreg +
weathers OB. Unit weathers
yellow gray.

B 11.0 Siltstone, shaly, micaceous
lenticular bedded massive
in upper 2, weathers yellow
gray some yellow-orange
stain.

A 21.0[±] Fe impreg sandstone ledge.

Unit C. 75' ± to N,
start on base ss ledge
correlative with 21.0 ledge
for part B.



B

12.8'

Sandstone, chiefly fine gr.
thin bedded, with interbeds
gray to dark gray shaly siltst
SS is 12m. to 8-12m. has
Fe impure, layers locally,
commonly at base.
and where thin sand
layers & the shaly siltst.
Laterally ss thins & is
chiefly shaly slope to the

A

3.0

Siltstone, shaly, gray to dk
gray interbeds, thin, at
fine gr ss. Parting shaly
Gv. roots

Road cut of U.S. 16 shows variation of
A, B, C units in part 2, with the B
siltstone at base and shaly
L. shales. Locally, however, lateral
changes in the thickness of the
Fall River cuts + is very irregular.
Base of part B in road cut 5 is
well marked, mainly siltstone
with yellowish, has X-bed thin
Fe impure SS. and is capped by
a shale with carb. no impure
a block on top of the ss. and
contact. No Fe spots in the shale
this contact.



W-17 Fuson Canyon

Pt A Handleveling up type. from top
sandstone beginning pt. B.

Approx. 5.5± wash covered slope flat
of red + yellow clstn in
upper part.

5.0± covered to base of platy
weather ss of next unit.

6.5± Sandstone, fine gr., lam. texture
rippled with rip laminae
weathering to odd bedding
patterns. Interbedded shaly ss.
micaceous. Has covered interval
near top.

4.0± Sandstone continuous with
below but massive x lam
to irreg. tabular. med gr.
mic. weathers light grey.

18.0± Covered to base of ss cap,
dip slope (~~down~~ to base)

1
15



37.- 2 Sandstone, massive, x-lam.
locally tabular x lam, red to
light brown or red brown
some black. Brownish gray
jointing weathers to
jagged ledge, fine + med. gr.

Gravel wash on dip slope of crest

Part B Can be measured down from
ss at base part A.

160 Sandstone, massive, x-lam
to lam, bed + lenses ± 1 ft
thick with some interbeds
shaly siltstone. Top bed
is 2' or more. Brownish gray.
loc rippled + worm tracked.
Grades to underlying unit.
Fine gr. med, weathers

Part C Wind Canyon, face showing
numerous ss beds

This is the "type" of Devon.

At this locality the "Fuson"
beds thin out ss right up to base
massive "Dakota", from base
of platy ledge Part B. Contact
prob at base ss. All stuff
exposed beneath platy ss is



gray clstn. vev red mottling
+ yellow stain.

Section starts at top massive ss
ledge, part of which prob.
include about 12' section B
ss only 4' of interbedded ss
on top this ledge till vev. clstn.

49.0 Sand of med. gr, massive
x-lam becoming tabular x-lam
in upper part. Weathers brown
to OB. Basal 10' obs. may be
soft.

4.2 Coarse to conglomeratic ss.
cht + qtzt grains + granules
chiefly vev coarse ss,
few granules.

24.4 Sandstone, fine gr, silty and
siltstone. Massive ledge locally
10' at 1' interval from 4' below
top. H2S 0.7 Fossils cap.
Lent + x-lam has ss beds in
FOOB. Middle 6 to 10' chiefly
massive fine gr ss, basal
4.0' has interbeds gray
shaly siltst.

2001 contd.



- 26.0' Sandstone, coarse grained, 0.2-1.0' cross bedded. 0.2-0.4' Fe stone cap and another red Fe stone band 3 to 4' from top. Lower 6.0' fine grained coarse gr. fragments white silty clay. Basal 1-2' Fe impreg, locally conc.
- 15.0' Clay and silty clay, silty gray weath yellow at top to white weath silty clay, harder at base. grades to unit below
- 7.0 to 10.0' Hard white siltstone and sandy siltstone. upper 6' purple mottling white mottling, lower 4' purplish. Med. gr sandstone loc. local foraging mineral zones, some chert. at top. W.P. pebbles loc sep by yellow clay
- 9.8 Siltstone, and silty claystone cherty with subconch fract. loc. local massive silty beds, purplish red. Fe hematite veins near base
- 6.5 Siltstone, massive, few claystone plugs, weathers gray purple some yellow stain Fe barite veins at top
- Structure wash



W-18

Carlisle quad. Morrison s. con.
SW of W-13. Cebu Cr. section.

Going up

Known as sh. Dk gray fissile sh.
Some at top with white vein
finer-splinter ls. color
about 5' from top

12.5 Some sh., fine gr. gray
x-lamin & bedded at base
grades to sh. sh. clay
becoming yellow & purple
clay sh. sh. sh. sh. sh.
yellow sh. sh. sh. sh.
lamin. gray sh. sh. sh. sh.
yellow sh. sh. sh. sh.
interbedded fine sh. sh. sh.
interbedded gray yellow sh.
chert sh. sh. sh. sh.
sh. sh. sh. sh. sh. sh.
0.3 bed sh. sh. sh. sh.

4.6 Interbedded sh. sh. sh. sh.
clay sh. sh. sh. sh. sh.
fine sh. sh. sh. sh. sh.
sh. sh. sh. sh. sh. sh.
sh. sh. sh. sh. sh. sh.
sh. sh. sh. sh. sh. sh.
and this continues to base



thin, sandy, limestone, 0.8 from top.
Above this it is a gray
clay. claystone.

1.0± Limestone, massive, appears
light gray, weathers gray
white some brown stain

8.4 Claystone, ^{var.} green to greenish
gray and red, silty claystone
Thin limestone layers above
but pinkish, silty, 2.0 to 4.0 ft
above. At top is 0.2 ft of
light gray silty, platy
limestone. In the
weathers light gray
X-lam, loc. has ripple marks

10.8 Claystone, silty, greenish
red and gray

2.8 Sandstone, calcareous, to
sandy limestone, loc.
1.3 to 1.5 ft. silty, calc
silty to fine ss. Upper
part calcareous, massive,
silty, to 1.0 ft. thin
bedded ss & calc. The
ss. Includes patches
of coarse ss and s. m. 37



chert & quartz granules, bone
frequently shell fragments &
clay pellets; weathering
brown but has light
gray green color on river
breaks. Lower part
has light green gray,
some brown shale. Fossils
abundant, all small. For
low, dark, brown.

12

Siltstone & clay shale, some
calcareous, some
hard, some
gray, some greenish, some
low, low, fine.

14.6

Claystone, calcareous, very
greenish, some gray
Zoned, some
from 3.2 to 10 ft from
base.

4.6

Claystone, calcareous,
some gray, some green chert
with some small nodules
is, and calcareous
nodules.



- 4.5 Claystone, red + yellow var. calcareous
- 2.5 Nodular limestone in green-grey calc. claystone, locally forms crumbly block in bare slope. Some rolled red in upper + lower parts, gradational above + below the limestone. Sharp upper to lower zone
- 5.6 Claystone calcareous, chiefly red, with 1.5 green calc. claystone containing limestone nodules at top.
- 2.2 Claystone, calc., chiefly red, some yellow + gray mottled.
- 5.8 ^{and} Claystone calc., ^{in lower 3.1} limestone, ^{dark gray} to dark green, some red mottling in lower 2.0. and light green in upper 1.5. Continuous with unit above.

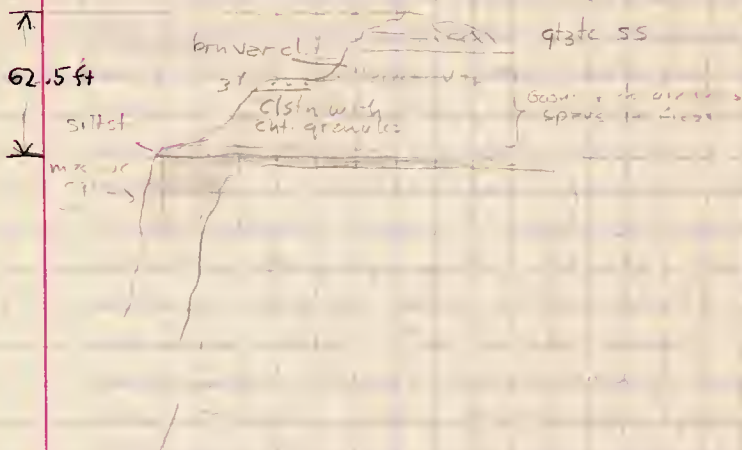


- 7.0 Claystone, noncalcareous, var gray, dark ^{purpl} gray & green gray, upper 20' light gray green, calcareous. chiefly dk purple gray, some brown, some green mottling at base.
- 8.3 Claystone, noncalcareous, gray to dark gray.
- 4.3 Covered zone, west of salt cgl at base of section.
- 48.0 Sandstone, med to coarse, with lenses of chert & argill. pebbles cgl in lower 20'. Upper 8'-10', med. gr., f. med. somewhat silty, med. thick bedded & bed. Lower 4' med. to coarse x-bedded, irregular ss & cgl.
- At top, upper 2', becomes silty & green. Med to fine gray white siltstone which in turn goes into a silty claystone. The siltstone caps brown back from point where section was measured.

Follows down beach belt to N. Jones



higher knob capped - a brown waxy
sandstone and quartzite.

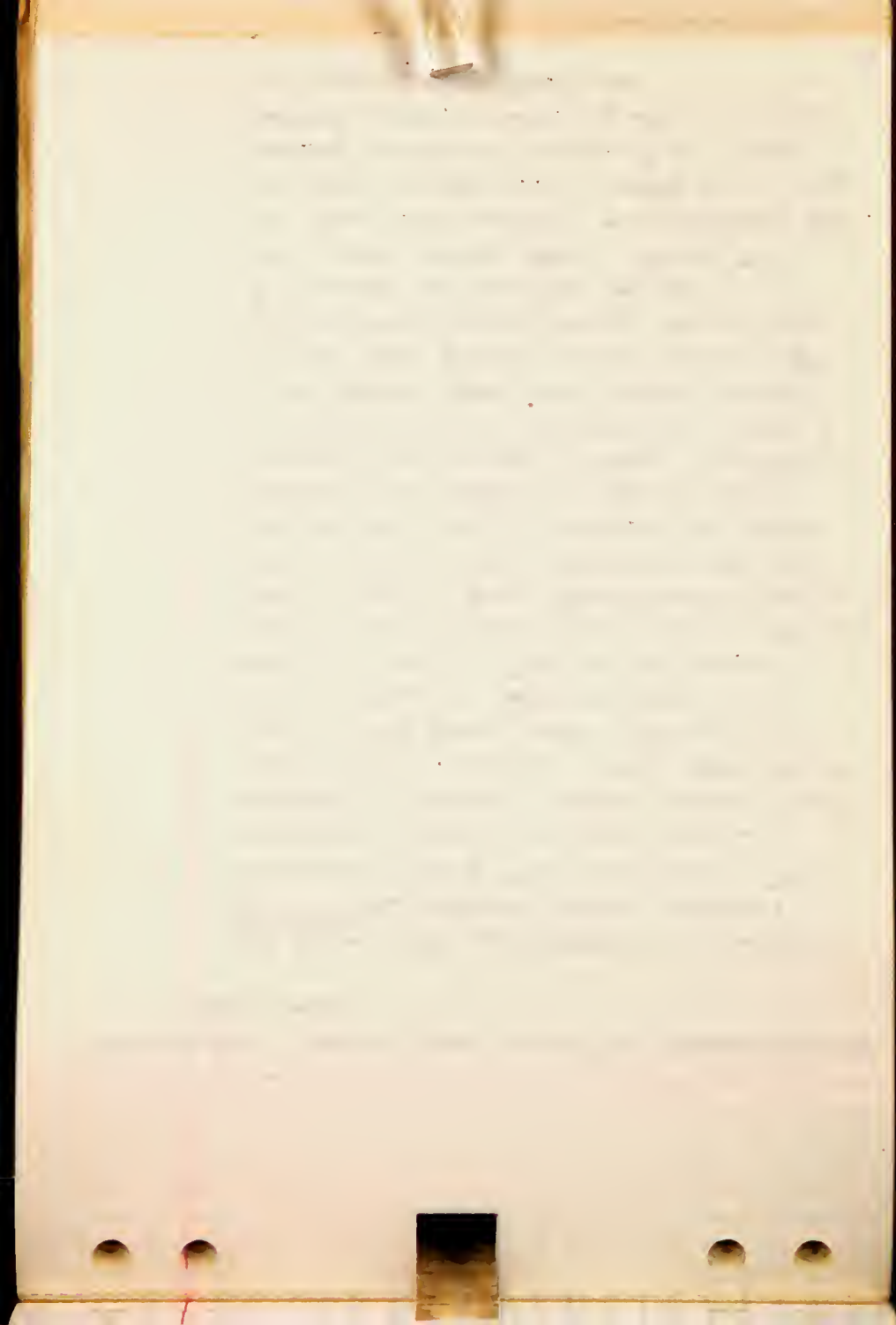


45 on a bench 5' to 3' thick from
local bench, and a small bench. Above
this brownish red sandstone. Below
it gray clstn + sandy material in
cl + qtz grains + quartzites locally.



Northeastern Carlile Quad. with Max Bergendahl and Bob Davis.

Fall River - here consistently 3 sandstone units with dk gray shale interval between #1 and #2, ascending. #1 is thin bedded chiefly, rarely becomes massive. Distance above contact with Fuson-Lhotz varies. Shale between it and #2 dk gray with selenite. No obvious thin ss beds + Max didn't mention any. #2 is the most prominent, most consistently massive tho it may have thin-bedded parts. Max pointed out calcareous, round, concretions in it, formed by CaCO_3 impreg. in spherical form. Also some thin lenses CaCO_3 sandstone in base, - convex downward where I saw them. Max has found no cgl in the Fall River, consistently ~~th~~ fine-grained, commonly micaceous. #3 sand separated by only a few feet sandy shale from #2, is more commonly thin bedded but locally it too gets massive - may locally coalesce with #2. Top seems consistently platy. Overlain by good Skull Creek sh.



Fall River - Lakota contact. Seen at A, B, D, and the Carlile Mine road cut. At B, considerable, $\pm 15'$ shale between change to Fe speckled var. clstn and the 1st Fall River ss. At A, a thin grey ss with plant frags is at base Fall River & sits on light grey clayey siltsine, then comes var. zone. At D, a good break from grey, carb speckled, silty clstn to light grey then var. yell. & red. Fe speckled clstn. At the Carlile Mine the contact zone very atypical and good break in lith. not evident. Here there is much carb. matter, including liq. sh. in the interval between the 1st Fall River ss and highest Lakota. Should get section of this.

Fuson-Lakota unit: In this area the

Lakota is consistently sandy & cglte. A lower massive cglte ss is commonly a cliff former but passes locally, in part, into unconsol. gravelly sand. Above it is locally (viz Black Gulch & Carlile mine) a clstn interval with some ss layers, then an upper massive ss. (letter ~~5~~ - 43



carries the uranium at the Carlile Mine) Locally one of the sands in the clstn interval thickens and it joins those above and below to form a single unit of sandstone est. by Max and Bob to be at least 150 to 165 ft. locally. This happens in Black Gulch, lower half in the SE $\frac{1}{4}$ sec. 34, T52N, R. 66W. Also is clstn zone above ~~top~~ Lakota ss but not certain how much.

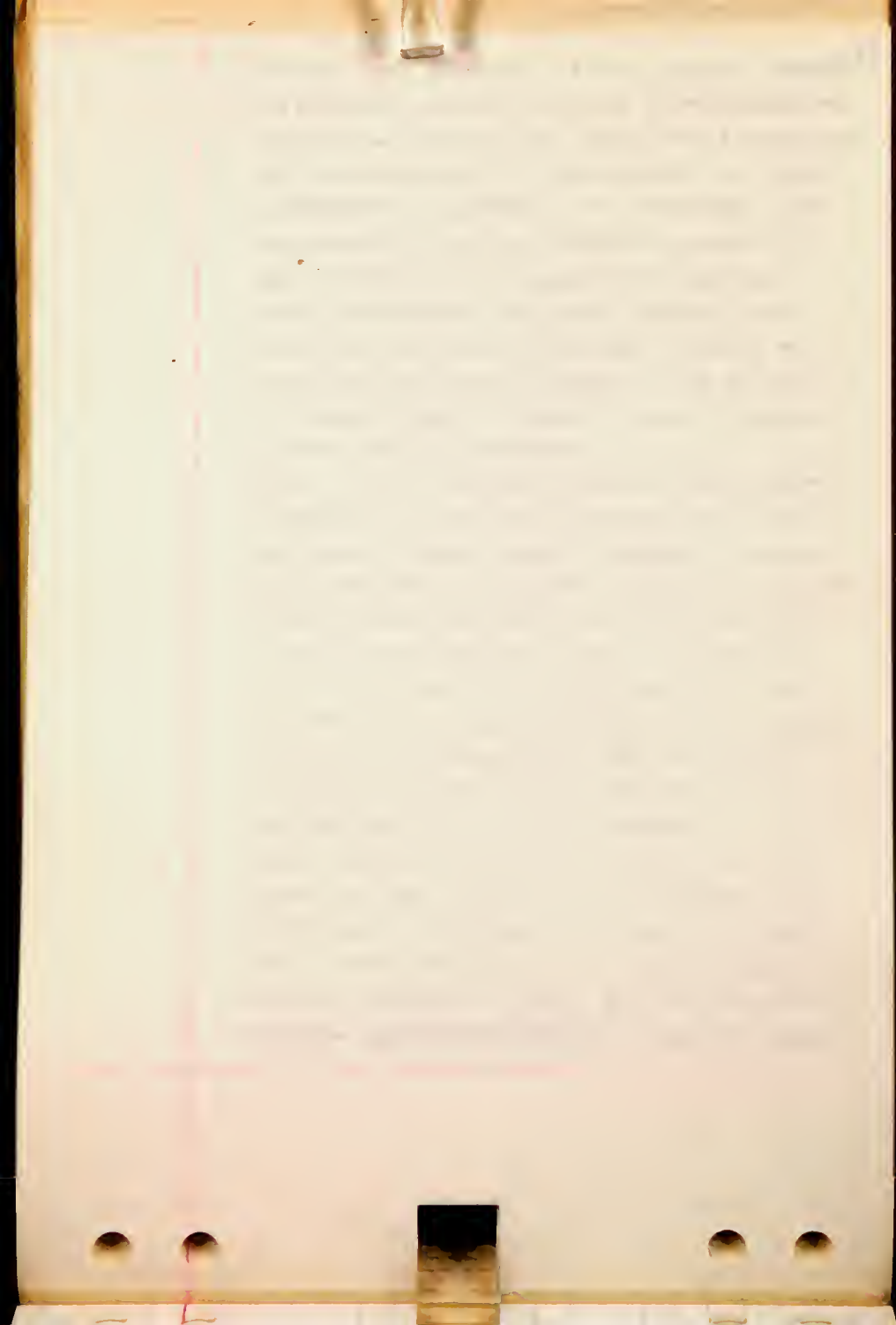
Unconsolidated clayey + sandy gravels common feature of Lakota in this area, and they contain polished pebbles as elsewhere. The top ss is above these, the lower, larger ss is both below and at least in part equiv. to them. Locally lower ss has break with soft beds — usually fairly coarse or gravelly (See Loc. A for good section of coarse lower beds — and on up into Fall River but top ss small or absent)

Most unusual feature is the constancy of thick cglte sandst. in this area. Cgl at very base typified by abundance black chert pebbles.



Lakota-Morrison contact. - As in other nearby sections the basal Morrison cgl locally sits on dark gray non-calc. claystone which grades downward into calc. green + red var. calc. claystone without the slightest sign of a break in sedimentation. This change studied closely at W-18 (secp. 36 this ntbk), where the calc-noncalc change takes place in an inch of greenish gray + gray claystone. Some banding of alt. green + gray is present but both occur on either side of change so that the color break between green (or var red + green) + gray does not correspond to the change from calc to noncalc.

Consequently in this area 3 choices for placing this contact. 1) at calc-noncalc break [See the cglite ls + calc claystone in W-13 cabin creek to illustrate worthlessness of this criterion] 2) at color change in claystone [illogical on grounds that it is obviously a gradation + that Morrison elsewhere has gray + dk gray claystone in it] 3) at base massive cglite ss. [only logical break locally 45



but here again can be shown that
this ss goes out completely to SE. -
see W-12 - leaving no obvious basis
for similar separation in other
areas.

Advised Max to lump Fuson + Lakota,
put Morrison contact at base of
his massive Lk. cgl. ss. His #1
Fall River is near enough to contact
just below to serve as base in
mapping.



W-19 Cambrian sections

A. Camp Creek.

Starting base roof ss over caved
adit E of cv.

- 1.2 Sands fine, med gr, massive
weathers O.B.
- 0.5 Lignitic shale, weathers blue
gray.
- 0.1 Shale, brittle brown gray,
weathers white, probably
porcellanite, plant fossils
- 0.7 Lignite, impure shaly
- 4.3 Sandstone, thick beds,
med-gr. friable sandy
ss weath buff + yellow
gray
- 0.6 Lignitic shale +/or lignite
- 8.5 Sandstone fine gr, massive
x-lam. weathrs gray white
with yellow s-stains.

21.
2.5
18.3

0.4¹ Lignitic sh. & lignite.

18.3 Sandstone, tabular, x lam.
locally massive, fine
to med gr, top stained dk
brown with trails. Weath.
yellow gray to CB.

1.1 Sandstone shaly, fine gr.
lam. dk gray with many
plant frags

1.8 Siltstone, massive, light
gray weathers white
yellow stain

2.1 Siltstone and sandy siltstone
friable, partially obscured,

2.2 Quartzite, very fine grained
massive, vert. erect. gray
weathers CB stain

same
bed

100 ft N.

2.5 Quartzite - see above

3.0 Sandstone, fine gr, massive

500
-1-
1/2

in thick beds structure is
hard, continuous with
quartzite below and locally
qtzitic weathers yellow gray

1.7 Claystone, black - dk gray
sandy, locally more of a
shale, weathers light brownish
gray.

52.0 Sandstone, tabular x lam,
to massive x-lam med to
coarse & fairly cglitic
weathers gray & gray white
with yellow stain. Coarsest
cgl stringers in middle part.
Isolated polished pebble
2 1/2" long diam. found in
coarse ss 26' from base.
Goes to med + fine with
local coarse zones to
upper 6'. Contact with
ledge above shows
some interbedding of
ss types, locally some
platy ss just at or
under contact.
More polished pebbles at
contact with ss above



41.0± Sandstone, med. to coarse-grained with foot \pm very coarse to cglite ss. at base. Forms massive ledge vertical face.

5.0± Partially obscured. At base is 1' \pm platy micaceous ^{sandy} siltstone & shale, weathers white, grades up into light gray, white weath clstn. Gets platy ss in upper part.

49.0± Sandstone, med gr, tabular & lam, forms shelving upper slope above cliff former below but here to join lower one on cliff face, weathers both to yellow gray.

26.0 Well covered interval, some dark gray white & some red wash in lower part

31.8 Sandstone tabular to lam to massive, yellow gray some red, med gr.



Top of flat on divide

Neither the Fall River nor Morrison contacts can be distinguished with certainty at this locality. The section definitely begins above the Morrison, but the interval under the upper 31.8 ss may include Fall River contact, or may be in Cambrian. Need more sections in Cambrian area to tie in.



W-20

Newcastle sections

A- U.S. 85 roadcut thru Mowry + Newcastle
beginning in Mowry.

5.9 Sandstone, fine-gr, hard, in thick
massive beds, weathering yellow
gray, to brown.

11.5 Siltstone with interbeds silty
shale and local lenticular
beds of fine gr. ss. Siltst
is laminated has thin ss
beds loc., becomes shaly
downward, lower 0.5
is clay. - gray silty shale
silt fine ss.

1.3 Shale, gray, silty, micaceous
contains laminar + thin
beds silt. (Sample 1)

6.9 Bentonite. +/- bentonitic sh.
light green at top, gray green
to blue green in lower 5',
some blue gray, light.
(Sample 2)



- 1.4 Shale, black, carbonaceous, silty, locally grading to carb silty siltstone.
- 1.0 Sandstone, fine grained, loc. silty, and siltstone, gray to light gray, irreg. bedded, weath. light brownish gray some Fe brown on bedding surfaces. Has scat carb frags.
- 4.8 Irreg. interbedded dk gray to black silty shale, siltstone and minor light gray fine gr ss. carb frags abundant thruout. Shaly siltstone is dominant. Lower 1' is a light gray shaly siltst.
- 5.6 Sandstone, fine gr, tabular here, in beds 0.4 to 2.0 with some shaly siltstone partings showing worm tracks + dinosaur foot prints.
- 0.8 Shaly, dk gray silty, interbedded and finely interbedded with siltstone.



- 0.6 Claystone, gray, with 0.1 to 0.2 white porcellanite at base.
- 1.7-3.5 Shale, blocky, carbonaceous becoming silty at base. Thickens up dip at expense of ss below and thin porcellanite comes in 1.7 from base, beneath, it dk gray siltst. grading to gray.
- 5.5-3.0 Sandstone, tabular to irregular, hard, weathers to gray
- 2.8 Claystone, light gray, finely silty, blocky to splintery fracture, (sample 5)
- 15.5 Sandstone. Fine-gr, lenticular, irreg lense, loc lam. to irreg thin bedded, some massive x-lam beds weath. shaly gray ledge Has interbeds silty ss and gray siltstone
- 1.7 Sandstone, fine gr, soft, in thin beds with lam + thin beds of black carb sh.



8.0 Claystone grading to
siltstone, upper 2' is
clsty, slightly silty at
base, with dk gray zone
at top, rest gray.
Then grad to thru gray
silty claystone to clayey
siltstone, basal 0.7 is
dark gray hard sandy
siltstone

2.6 Sandstone, single mass or
ledge of fine gr ss with
czub frags thruout

4.4 Siltstone, ^{inter}bedded with
bedded with dark gray
silty shale. Some vertical
lamin bedding due to part
to wash working. Czub frags.

4.8 Sandstone, pliny to
thin bed with czub
laminize. Dark shaly
partings. Chiefly fine gr
locally silty.

Fault Plane



Edgemont area with Garland Gatl
(Thursday Aug 4)

See Edgemont NE S. Dak. 7½ sheet, for localities noted below. (with packet of maps on Inyan Kara study)

Fall River: Variable succession chiefly because of local thick channel sands in upper part. At Loc. A. which is just off map, can see upper FR ss., then dominantly clayey succession and another ss just above creek. Clayey beds include a varicolored zone - chiefly red, which is in same approx. position in relation to upper FR ss as that at Rapid City and, possibly, that in road cuts off Wyo 111 across N. Bearlodge in Crook Co. This zone should be fairly persistent if it is a good genetic change. Worth checking its relative position in Devils Tower area.

In Red Canyon Cr. cut an excellent exposure of channel ss coming in abruptly in upper part of clayey zone and truncating the varicolored clays. Cuts them out abruptly to W. Garland

[cont. N+bk 5(55), IK #3, p.1]



W-21

Fall River Valley, 5 mi. S. Hot Springs S.D.

Even's quarry on ~~W.~~^{S.} wall where river cuts into thick massive ss. If quarry face is in type then Fall River is not what we are taking it as. This should be cleared up.

Skull Creek (in part)

(22)

3.0 - ?

Shale, black to dk. gray, siliceous, some Fe scales
1.5 from base

(21)

2.5

Shale, black clay, some very fine lam silt with gyp, possibly thin bedded locally?, in upper 1'; lower 1.0 is thin paracalcinites scatt. gyps Fe spongy cones at top silt zone

(20)

7.8

Shale, dk. gray to black fissile at top and base with ^{more} gyp weather siliceous 1.0-2.0 wide 2.5 to 3.0 ft. Sample A - venterose, rain this siltier zone

6436

VP only

(19)

4.7

Shale
Dk. gray to black fine

†

Op. from lens



ls cen
top 24'

(18)

7.4

Shale, chiefly as above
somewhat silty in upper
1.5 ±

(17)

10.0

Shale, as above, zone 0.4 ±
gray flint limst. concs
at top. Some soft, fr
stained 1st concs at about
5' from top.

Shale, as above, zone
0.3 ± conc. limestone
at top. Shale is softer
than above.

(16)

24.0

Shale, as above, questionable
interval, may be 10' ±
short due to slumping.
Loc irreg ls lens 3' ±
from top.

(15)

3.8

Silty sh + sh. Upper 0.5
ferrog. shale local ferrug
concs. Then about 1.5
blk sh, then 1.3' tough
black clay with tr red
& rusty stain, latter
± silty zone.



(14)

2.2,

Shale black, silty in
lower half with silt
stained pink

Fall River contact

(13)

2.0

Interbedded silts, sh.
+ silty sh. Ivory band
light gray sand, silty &
fine gr. ss. upper rounded
stained, ptngs gray fine
shaly

(12)

(12A) 4.8

Sandstone, thin bedded
fine gr. loc. x-bedded,
ripple bed. some loc.
bedding. ls. beds to 1.0

(12B) 14.8

Sandstone, 2' zone, more
massive beds, up to 5'
loc. x-bedded. brownish
Beds of transition
bedded or thin bedded
unit below.

Circle to local sec. on Big St. River
section, falls in Fall R. - ca face
to river from Powerhouse N. the
Unit A thing is seen, with
lower massive part
brownish, thin bedded, rip
pled with trace of.



(11)

6.0 ± Siltstone, laminated with
bl. sh. plates, in thin
beds, light gray-white,
with some irreg interbeds
~~ss in upper part~~. Weath. is
gray with red & yellow
stain, lower 1.5 ± chiefly
~~fine gr~~ fine siltstone.

This unit goes sandy
1st, with thin Fe impreg
x bedded ss.

(10)

cerst

Note - up.
part of ss is
med-coarse

Sandstone even bl. bed -
x bedded x lam, brown
weath fine-med Fe
impreg cap on upper
2 inches ±. Some gray
shaly silt plugs + red
stain on bedding. Weath. is
buff to brown
Some shale inter in irreg
base, also layers coarse
ss at base + some
clay pellets.

(9)

10.0

Claystone, light gray to
dk gray + reddish gray
local purple mottling.
Locally silty, common 60



silty base grading to siltst.
below. Laterally variable, yellow
stone below mid bl. band - splenetic

(8)

6.7

Siltstone, upper 0.9 a bed
sandy carb silt, rest
massive coarsely, loc.
carb, plant frags + much
pyrite throughout. Upper 1/2
weathers dark gray to
black, lower Feston
0.1 V + brown. Laterally
ss 2.0 comes in under black
and beds below loose
are brownish some pink
gray at base -

(7)

4.2

Sandstone even bedded
massive to low, fine gr
weath's brown, loc Feston,
/

(6)

4.0

Siltstone with 4.0 ft silty
ss to middle part.
Gray loc drab upper
with Fe speck. giving
purple to pink cast
Lower is gray clay tone.

(5)

6.2

Sandstone even bedded to
thin bedded, some Feston
base in, mic carb.



(4)

3.0 Silty, silty gray to brownish gray thin ss interbeds. Upper 1.5 chiefly platy ss sh ptg.

(3)

0.2-0.6 Coal, lignitic

(2)

0 -0.4 Carb hard siltstone & silty clay ss in local thin lenses

basal contact may be here or within 5.5 below.

(1)

5.5

Silty claystone & clayey siltstone. Clayey zone grading to siltstone brown thin carb frags. Fractile. The upper 1/2 is gray becoming red in mid part & gray at base. Local thin to spec. sand pebbles in mid part.

19.0

49.0

Sand, med, massive, tan med. gr., basal 1' thin beds with shaly

2.0

Siltstone silty gray to brownish gray, clayey



3.0-? Sandstone, fine gr., brown weather,
grades to siltstone, gray, as
above

Looks to me like solution to type
Fall River & its relation to the
discontinuity I've been making
its basal contact will have to await
more detailed study & mapping
of the area around the type.

Gzotend's

interp. has
channel Fall River
because its post-
Fuson.

In Colo. more def.
evidence that similar
channel deposits, while
post "Fuson" equiv (little) and
also pre Fall River equiv.
Question then is which
break more significant in
change from one genetic
unit to other.



